MA DEP Asbestos In Soil Workgroup
June 10, 2003

Week 4: Analytical Methods to Risk Assessment

TOPIC 1 – Analytical Methods in More Detail: EPA Region 01 Protocol

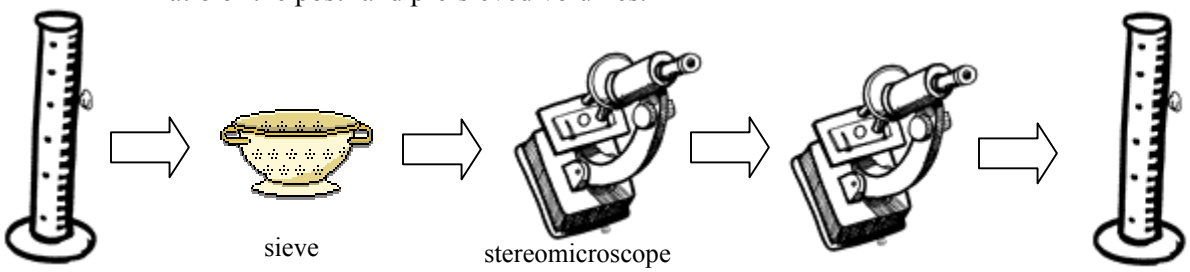
"The Protocol for Screening Soil and Sediment Samples for Asbestos Content Used By the US Environmental Protection Agency, Region 1 Laboratory" (12/5/97)

Primary Purpose: "to find asbestos fibers in the sample"

Quick Summary: Suspect fibers are identified in a cleaned-up sample using a stereomicroscope and confirmed as asbestos using PLM with dispersion staining.

More Detail:

1. A "representative" portion is removed from the container after thorough mixing for homogeneity. Volume is noted.
2. Sample is suspended in water and poured into a 60 mesh (250 micrometer) sieve to remove (reduce) the colloidal material, fine sand, silt, etc...
3. Sample is systematically examined under a stereomicroscope (10x to 20x) for asbestos fibers or bundles. Suspect fibers are removed and placed on a microscope slide.
4. Slide is dried and prepared for PLM analysis.
5. Slide is examined by PLM with dispersion staining to identify fibers found and confirm the presence of asbestos.
6. Fibers are returned to the sample and entire sample observed to make a visual estimate of the percentage of asbestos in the sample. Rule of thumb: samples with 1% or greater asbestos will reveal fibers within one or two minutes under the stereomicroscope.
7. Volume of examined sample is noted. Asbestos content of whole (pre-sieve) sample is estimated by multiplying the estimated %-asbestos in the examined sample by the ratio of the post- and pre-sieved volumes.



Topic 2: Analytical Methods in More Detail: The Tumbler Method

"Superfund Method for the Determination of Releasable Asbestos in Soils and Bulk Material" EPA 540-R-97-028 (1997), and

"*DRAFT*: Modified Elutriator Method for the Determination of Asbestos in Soil and Bulk Materials, Revision 1. Berman & Kolk, (2000)

Purposes: "provide results suitable for risk assessment", "be applicable to the types of asbestos-containing materials commonly encountered at Superfund sites", "facilitate reproducibility within and between laboratories", "control sampling and analytical costs"

Quick Summary:

More Detail:

1. Samples (minimum size = 1 kg) are collected from the site. Composite samples are encouraged to increase representativeness.
2. Sample is sieved with a $3/8^{th}$ inch (1 cm) opening to separate coarse and fine fractions.
3. Coarse fraction is weighed and discarded. Fine fraction is weighed and homogenized.
4. Fine fraction is repeatedly sub-sampled using a riffle splitteruntil sub-samples weighing between 50 and 80 grams are produced.
5. A sub-sample is loaded into the tumbler and "conditioned" for several hours to standardize the humidity.
6. The tumbler is started
7. Dust/asbestos produced from the tumbler is collected and analyzed three ways:
   - a series of filters is collected and weighed to plot the cumulative dust loss from the sample
   - a second series of filters is collected such that loading is appropriate for specimen grid preparation using a direct transfer technique
   - asbestos structures are trapped in the suspension of a scrubber, diluted and filtered to be prepared for analysis
8. TEM specimen grids are prepared.
9. Specimen grids are analyzed using ISO counting rules for asbestos in air
10. Calculations are conducted to estimate:
    - mass of dust co-collected with asbestos on the anlyzed filters
    - total mass of respirable dust in the original sample
11. Dust estimates are combined with asbestos counts to report:
    - concentration of asbestos structures per unit mass of respirable dust (s/g_{PM10})
    - concentration of asbestos structures per unit mass of the original sample
12. Asbestos concentrations can be reported for a specific size range.

FIGURE 3-1
SAMPLE COLLECTION AND FIELD PREPARATION

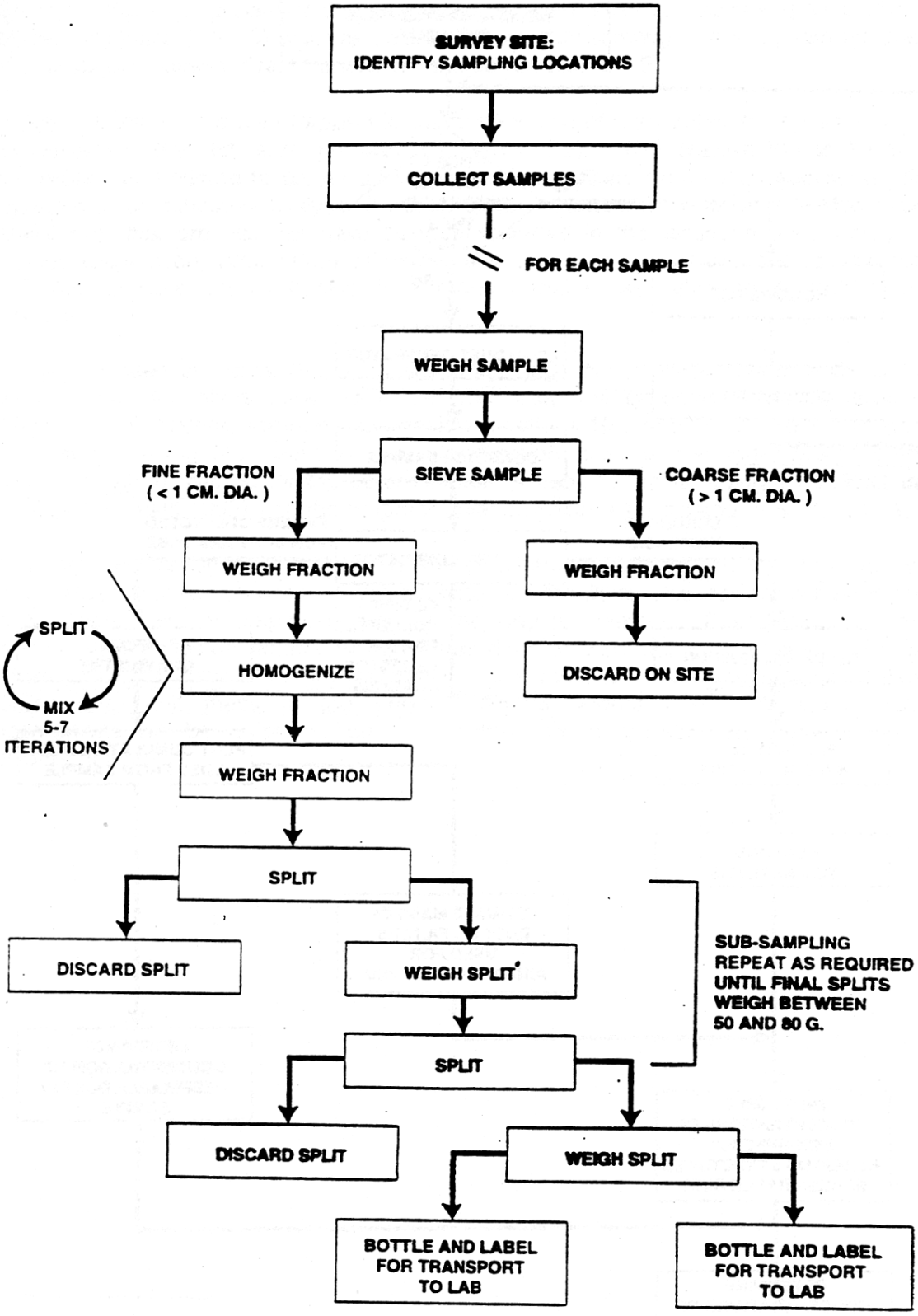
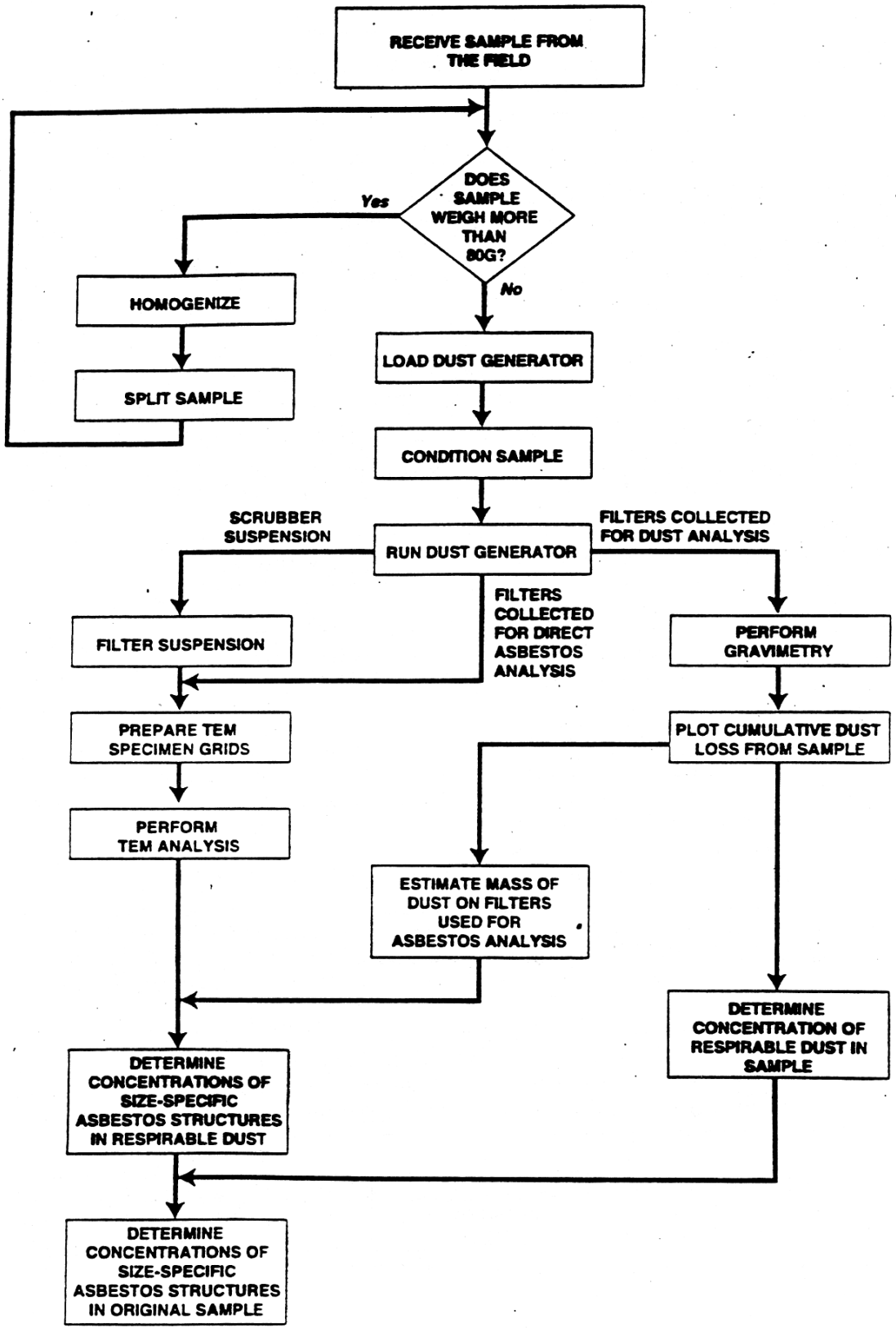


FIGURE 3-2

LABORATORY PREPARATION AND ANALYSIS



Elutriator Set-up, Figure A-10 (modified)